MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2215)

PPC0116 – PRE-CALCULUS

(All Sections / Groups)

22 FEBRUARY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of **3 printed pages** (including the cover page) with **4 questions only**.

2. Each question is worth **25 marks. Attempt ALL questions.**

3. Please write all your answers in the Answer Booklet provided. **Show all relevant steps** to obtain maximum marks.

Question 1 (25 marks)

(a) Solve the following equations:

(i) $(x-2)^2+7(x-2)+10=0$. [4 marks]

(ii) $\sqrt{21+x}=3+\sqrt{x}$. [5 marks]

(b) Solve the inequalities and write the solutions in interval notation:

(i) $|2x+5|\geq 7$. [3 marks]

(ii) $\frac{x+4}{x+2}>2$ (use test interval method). [6 marks]

(c) Simplify $\frac{3-\sqrt{2}}{3+\sqrt{2}}$ by rationalizing its denominator. [3 marks]

(d) Simplify $\left(\frac{3x^{-1}}{4y^{-1}}\right)^{-2}+\left(\frac{y^{-2}x^3}{y^3x^{-2}}\right)^{\frac{2}{5}}$ so that all exponents are positive. [4 marks]

Question 2 (25 marks)

(a) For the polynomial $f(x)=(x+1)(x-2)(x-4)^2$,

(i) determine the end behaviours of the graph of $f(x)$. [1 mark]

(ii) find the x- and y- intercept(s), if any. [3 marks]

(iii) find the multiplicity for each zero, then state whether the graph touches or crosses the x-axis at each x-intercept. [3 marks]

(iv) determine the maximum number of turning points. [1 mark]

(v) sketch the graph of $f(x)$. [4 marks]

(b) Given $f(x)=x^2$, $g(x)=\frac{1}{\sqrt{x}}$ and $h(x)=\frac{1}{x+1}$. Find:

(i) $f[g(h(x))]$ [3 marks]

(ii) $h^{-1}(x)$ [3 marks]

(c) Solve the following equations:

(i) $11-2e^{x+3}=5$ [3 marks]

(ii) $2\log(x)-\log(2x-1)=0$ [4 marks]

Continued....

Question 3 (25 marks)

(a) Use long division to find the quotient and remainder of:

$$f(x)=\frac{2x^5-5x^4+7x^3+4x^2-10x+11}{x^3+2}.$$ [5 marks]

(b) Given $f(x)=3x^3+2x^2-19x+6$.

(i) Show that $x+3$ is a factor of $f(x)$ by using the factor theorem. [2 marks]

(ii) Use synthetic division to find the quotient and remainder of $\frac{f(x)}{(x+3)}$. [5 marks]

(iii) Solve the equation of $f(x)=0$ using the answer found in part (ii). [3 marks]

(c) Determine the partial decomposition of $f(x)$.

$$f(x)=\frac{x^2+x}{(x-1)(x^2+1)}.$$

[10 marks]

Question 4 (25 marks)

(a) The 8^{th} and 17^{th} terms of an arithmetic progression are -20 and -47, respectively. Find the first term, a and the common difference, d. [6 marks]

(b) If $6,-4,\frac{8}{3},-\frac{16}{9}$..... is a geometric progression. Calculate the following:

(i) The common ratio and sum of the first 13 terms, S_{13}. [4 marks]

(ii) The sum to infinity, S_∞. Show that the series converge. [3 marks]

(c) A runner is preparing himself for a long distance race. He covered 6 km on the first day and then increased the distance by 0.75 km every day. Using arithmetic sequence/ series formula, find the following:

(i) Calculate the distance that the runner can cover in the 14^{th} day. [3 marks]

(ii) Find the total distance the runner will cover in 25 days. [3 marks]

Write down the conclusion for each questions.

(d) Use the Binomial Theorem to find the first **SIX** terms of $(2+x)^{20}$ in ascending powers of x. [6 marks]

End of Paper